ECHO
Environmental influences on Child Health Outcomes
A program supported by the NIH

Study Summary

PFAS Exposure During Pregnancy Not Associated with Behavior Issues in Children, ECHO Study Finds

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Who sponsored this study?

The Environmental influences on Child Health Outcomes (ECHO) Program, Office of the Director, National Institutes of Health supported this research.

Why was this study needed?

Per- and polyfluoroalkyl substances (PFAS) are a class of thousands of man-made chemicals used in some consumer and industrial products like cookware, stain-resistant fabrics, and foams used to fight fires. These substances are often referred to as “forever chemicals” because they don’t break down easily, causing them to build up in water, soil, and air. Previous findings on the effects of prenatal PFAS exposure on child behavior have been inconclusive due to small sample sizes, limited exposure variability, and differing measures of child behavior. This study looked at the relationship between PFAS exposure during pregnancy and child behavior using harmonized measurements collected from many mother-child pairs from across the United States.

What were the study results?

Most of the PFAS detected in pregnant mothers were not clearly linked to behavior problems in their children overall. Children whose mothers had medium levels of exposure to perfluorohexane sulfonate (PFHxS) during pregnancy showed more emotional problems, like being easily upset or withdrawn, especially when they were preschoolers. However, this pattern was not seen at very high or low levels of PFHxS exposure. There were no strong connections between PFAS exposure before birth and behavior problems when the children were older (school-age). Looking at combined exposures to multiple PFAS also did not show any clear relationship with child behavior.

What was the study’s impact?

While most PFAS showed no association with behavioral problems, some suggestive, non-linear relationships emerged, indicating that these exposures may influence brain development in complex and unexpected ways. Overall, the study did not find strong or steady links between PFAS exposure during pregnancy and child behavior problems. More research may be needed, especially about newer PFAS replacement chemicals and exposures that happen after birth.

Who was involved?

The study included children from nine ECHO Cohort study sites across the U.S., including 1,723 preschool-age children (1.9-5.9 years) and 627 school-age children (6-15 years).

What happened during the study?

During the study, researchers measured PFAS levels in blood samples collected from mothers between 2- and 42-weeks' gestation. Later, the researchers assessed children's behavior using the Child Behavior Checklist (CBCL) when they were preschool- or school-aged. They then used statistical methods to evaluate potential associations between prenatal exposure to PFAS and PFAS mixtures and child behavioral problems.

Footnote: Results reported here are for a single study. Other or future studies may provide new information or different results. You should not make changes to your health without first consulting your healthcare professional.

What happens next?

Future studies could help researchers assess the effects of PFAS exposures during the postnatal period, which may be a more relevant window for childhood brain development and behavioral issues. Additionally, as some PFAS are being phased out of consumer products and replacements are emerging, future studies could help researchers understand the potential effects of exposures to these newer replacement chemicals.

Where can I learn more?

Access the full journal article, titled "Prenatal Exposure to Per- and Polyfluoroalkyl Substances: Association with Child Behavior in the Environmental influences on Child Health Outcomes (ECHO) Cohort," in *Environment International*.